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**CLAIMS**

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[Claim(s)]

[Claim 1] The fiber layer which consists of a synthetic fiber in which dyeing and a heat set are possible, and the tensile strength of a single fiber are 18 g/d. Waterproof sheet characterized by giving the polyurethane polymer coat layer which has moisture permeability and waterproofness to the base material in which the above Para system aromatic-polyamide fiber contains the fiber layer intermingled at least 20%.

[Claim 2] The water resistance of this waterproof sheet is 1000mmH<sub>2</sub>O/cm<sup>2</sup>. It is 10000mmH<sub>2</sub>O/cm<sup>2</sup> above. Waterproof sheet according to claim 1 characterized by being the following, and for moisture vapor transmissions being 2000 g/m<sup>2</sup> and more than 24 hour 6000 g/m<sup>2</sup> and 24 hours or less, and \*\*\*\* resistance being below 800 g more than 100 g.

[Claim 3] The water resistance of this waterproof sheet is 1000mmH<sub>2</sub>O/cm<sup>2</sup>. It is 5000mmH<sub>2</sub>O/cm<sup>2</sup> above. Waterproof sheet according to claim 2 characterized by being the following.

[Claim 4] The two-layer fiber layer which constitutes a base material is a waterproof sheet according to claim 1 characterized by consisting of double knitting or double textiles.

[Claim 5] It is the waterproof sheet according to claim 1 which the organization which the fiber layer which constitutes a surface layer among the two-layer fiber layers which constitute a base material consists of single materials, and the fiber layer containing Para system aromatic-polyamide fiber consists of two or more materials, and constitutes these fiber layers is double knitting or double textiles, and is characterized by to consist of materials as the fibrin material which constitutes a surface layer with the same \*\*\*\* between two-layer fiber layers.

[Claim 6] The waterproof sheet according to claim 1 with which fiber layer thickness which constitutes the surface layer of a base material is characterized by 0.01mm or more being 0.1mm or less.

[Claim 7] The waterproof sheet according to claim 1 with which the fiber layer which constitutes the surface layer of a base material, and other fiber layers are characterized by having the composition of the combination of textiles and knitting.

[Claim 8] The fibrin material of the fiber layer which constitutes the surface layer of a base material is a waterproof sheet according to claim 1 characterized by being nylon filament yarn, polyester filament yarn, or those crimp finished yarn.

[Claim 9] The fiber layer which consists of a synthetic fiber in which dyeing and a heat set are possible, and the tensile strength of a single fiber are 18 g/d. Rain gear characterized by consisting of waterproof sheets with which it comes to give the polyurethane polymer coat layer which has moisture permeability and waterproofness to the base material in which the above Para system aromatic-polyamide fiber contains the fiber layer intermingled at least 20%.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the waterproof sheet and rain gear which have the three-tiered structure which has the outstanding incised-wound-proof nature and \*\*\*\*\*-proof.

[0002]

[Description of the Prior Art] Conventionally, the waterproof sheet covered with natural rubber, synthetic rubber, or synthetic resin to the synthetic-fiber textile has been used for tentorium, the truck hood, etc. by rain gear, such as a raincoat, again. Since the displeasure by MURE at the time of wear is given to especially waterproofing garments, the waterproof sheet and rain gear of moisture permeability have been developed in recent years.

[0003]

[Problem(s) to be Solved by the Invention] however, the incised-wound-proof nature by the projection with the conventional waterproof sharp sheet and \*\*\*\* -- what examined the powerful problem does not exist therefore, this conventional waterproofness sheet -- incised-wound-proof nature and \*\*\*\* -- it was very scarce powerfully, for example, was not what can be used for leisure fields, such as the work and forest work accompanied by the risk of the bodies, such as a guard official, construction work, or \*\*

[0004] The purpose of this invention is to offer the waterproof sheet and rain gear which have the outstanding incised-wound-proof nature and outstanding \*\*\*\*\*-proof, and moreover have moisture permeability.

[0005]

[Means for Solving the Problem] this invention adopts the following meanses, in order to solve the above-mentioned technical problem.

[0006] Namely, the fiber layer which consists of a synthetic fiber which the waterproof sheet of this invention sets [ dyeing and / heat ], The tensile strength of a single fiber is 18 g/d. The above Para system aromatic-polyamide fiber It is characterized by giving the polyurethane polymer coat layer which has moisture permeability and waterproofness to the base material containing the fiber layer intermingled at least 20%, and is characterized by consisting of waterproof sheets with which the rain gear of this invention has this three-tiered structure.

[0007]

[Function] Even if a dye affinity, weatherability or an adhesive property with a resin, etc. is poor and uses it as composition fiber, after rinsing was carried fully employ the feature efficiently, and although the Para system aromatic-polyamide fiber used by this invention is excellent in incised-wound-proof nature and \*\*\*\*\*-proof, this fibrin material is used while it had made this problem inherent when using this fibrin material as a base material.

[0008] this invention improves this fault and studies the base-material structure where the feature of Para system aromatic-polyamide fiber can fully be utilized. That is, the base material which constitutes the waterproof sheet of this invention consists of a fiber layer which consists of Para system aromatic-polyamide fiber, and a fiber layer which consists of a synthetic fiber in which dyeing and a heat set are possible.

[0009] This synthetic fiber is fiber which constitutes the surface layer of a base material, and it is desirable in a weatherproof row that it is an adhesive good synthetic fiber as well as dyeing and a heat set being possible. By engaging this fiber layer in the Para system aromatic-polyamide fiber layer strongly, the above-mentioned property of this fiber layer is utilizable more than enough.

[0010] As this synthetic fiber, nylon thread, polyester thread or those interweaving, union yarns, and also those crimp finished yarn are employable, for example. As a kind of fiber, filament yarn is good, and when it is especially textiles, a thing without a fluff is desirable. In order to make an opening small in knitting, crimp finished yarn is used preferably.

[0011] The Para system aromatic-polyamide fiber as used in the field of this invention is single fiber tensile strength 18 g/d. It is 20 g/d preferably above. It is 22 g/d still more preferably above. What it is above is used. If single fiber tensile strength is less than [ this ], incised-wound-proof nature and \*\*\*\*\*-proof will pose a problem. Moreover, at least 20% of the weight, this Para system aromatic-polyamide fiber needs to be intermingled 50% or more still more preferably 30% or more, and there is an inclination for incised-wound-proof nature and \*\*\*\*\*-proof to fall less than [ this ] in a fiber layer preferably. The mixture method of this fiber has the desirable method which passes and is uniformly intermingled in a direction and a latitudinal direction, although the volume on intersection, a union, or union-yarn usage may be what method.

[0012] Arbitrary polyurethane polymers, such as a polyester system or a polyether system, can be used for the polyurethane polymer coat layer which has the moisture permeability used by this invention, and waterproofness, and can be used for it with

one coat gestalt of the degrees. For example, the porous anodic oxide coating which applied and formed this polymer solvent solution in the form of the porous anodic oxide coating which direct-applied, or sank in, was immersed in the base material subsequently to the inside of solution, and formed the dimethylformamide solution of a polyurethane polymer in it, or the mold release paper can be used for a base material with a binder in adhesion arrival or the form where carry out line adhesion and it uses.

[0013] Although moisture permeability and waterproofness conflict mutually, since the large coat of an aperture will be obtained if you want to enlarge moisture permeability generally and concentration of a polyurethane polymer is made low, and the small coat of an aperture is obtained if you want to make waterproofness high conversely, and concentration is made high, according to a demand, a proper polyurethane polymer coat can be used, respectively.

[0014] Like \*\*\*\*\*, the polyurethane polymer coat which has this waterproofness is a coat or the form of a lamination, and constitutes an interlayer or a rear-face layer. That is, although this waterproof coat can be formed in the interlayer when it constitutes lamination \*\*\*\*\* for two sorts of fiber layers, this coat will be formed in a rear-face layer when a base material is a double knit fabric. What has a moisture permeability waterproofing film in this rear-face layer is [ an advantage which can also waterproof a seam ] and is desirable.

[0015] Moreover, as the way method for adjusting this waterproofness, when two sorts of fiber layers are engaged with a binder, it can also adjust with a coverage, application area, etc. of a binder between each class.

[0016] As a waterproof sheet of this invention, a water resistance (JIS L-1079) is 1000mmH(s)2 O/cm<sup>2</sup>. What it is above is desirable. Depending on a service condition, possibility that water will permeate comes out under by this water resistance. However, since the inclination for moisture permeability to fall will become strong if a water resistance is too high, the upper limit of a water resistance is 10000mmH(s)2 O/cm<sup>2</sup> preferably. It is 5000mmH(s)2 O/cm<sup>2</sup> especially preferably hereafter. What is the following is desirable. Moreover, as a waterproof sheet of this invention, a moisture vapor transmission (JIS Z-0208) is 2000 g/cm<sup>2</sup>. The displeasure according [ what it is above ] to MURE is hard to occur and is desirable. However, since waterproofness will fall if a moisture vapor transmission is too large, 6000g/m<sup>2</sup> and the thing of 24 or less hours are preferably desirable.

[0017] Although the waterproof sheet of this invention can be used also as protective clothing at the time of a scratch by \*\*\*\* and the rock in for example, forest work, surf-fishing, etc., that in which the incised-wound-proof nature of this sheet to a sharp cutter was excellent in that case is required. That is, what has incised-wound resistance in the range below 800 g more than 200 g still more preferably below 100g or more 800 g preferably is good.

[0018] Although this incised-wound-proof nature (protection nature) improves the more the more it thickens the Para system aromatic-polyamide fiber fiber layer, it becomes unsuitable as garments so much.

[0019] Here, the incised-wound resistance when carrying out the incised wound of the waterproof sheet with NT cutter edge marketed estimated the incised-wound-proof nature as used in the field of this invention. That is, form the edge for incised wound which 60 degrees was made to incline to a waterproof sheet test piece, and fixed this cutter edge to the arrowhead type at both sides, and receive this test piece side in this edge for incised wound. It attached in the base material for sliding which can go up and down in the perpendicular direction, this test piece side was dropped the speed for 500mm/perpendicularly, the amount of loads applied to this test piece when this test piece carries out the incised wound with this edge for incised wound was measured, and the amount of loads (value) was considered as incised-wound resistance (value).

[0020] As structure of two sorts of fiber layers which constitute the base material of this invention, the thing of the structure which consists of organizations of double knitting or double textiles may be excellent in flexibility. The surface layer of a base material is a fiber layer which consisted of single materials among two sorts of these fiber layers, and the Para system aromatic-polyamide fiber fiber layer may consist of two or more materials (mix spinning, interweaving). Moreover, it is desirable between two sorts of double knitting or double textiles of fiber layers to \*\*\*\* for the same material as the material which constitutes the surface layer. For example, if Para system aromatic-polyamide fiber thread is used as a binder yarn, for the difficulty dye affinity of this thread, dyeing nonuniformity will occur and grace will fall. Therefore, the fiber which constitutes the Para system aromatic-polyamide fiber layer has that desirable in which the same material as the fiber which constitutes a surface layer is intermingled. As for especially a binder yarn, it is desirable that it is the same material as the fiber which constitutes a surface layer. If two sorts of these fiber layers are engaged by sewing (quilting), a flexible base material can be offered.

[0021] The fiber layer thickness which constitutes the surface layer of the base material of this invention has desirable 0.01mm or more thing which is 0.1mm or less. That is, since it is not desirable to make it thin in order to satisfy the reinforcement effect and moisture permeability waterproofness, the Para system aromatic-polyamide fiber layer and a waterproof coat are made thin to the grade by which coloring, an adhesive property, and weatherability are attained. In less than 0.01mm, if thickness tends to be torn, and cannot attain the function as a surface layer and 0.1mm is exceeded, its waterproof whole sheet will be thick and it will become heavy.

[0022] Moreover, as for the base material of this invention, it is desirable that the fiber layer which constitutes a surface layer, and other fiber layers have the composition of the combination of textiles and knitting. That is, when one fiber layers are textiles, other fiber layers use knitting.

[0023] By adopting this composition, especially knitting, it can be thin, a base material can be turned flexible up, and generating of processing Siwa can be prevented further.

[0024] moreover -- although it is easy to generate Siwa since the difference of the rate of extension (or contraction) is between each textiles, when two sorts of fiber layers are stuck and it constitutes a base material -- this -- resins, such as polyurethane, -- a coat -- or it is preferably solvable, if it laminates and an interlayer is formed

[0025]

[Example] Hereafter, an example explains this invention further.

Nylon thread of 210 deniers of sizes which carried out \*\* NEN for example 1 surface-layer textiles at 80 T/m S Yori. It uses and the tensile strength of a single fiber is 23 g/d for rear-face layer textiles. The base material which the density of surface textiles becomes from the double textiles whose densities of rear-face textiles are length 28/inch, and width 24/inch by length 56/inch, and width 49/inch was manufactured using the No. 30 count spun yarn (sized single yarn) which consists of Para system aromatic-polyamide fiber. The length thread of rear-face textiles was used for \*\*\*\*\*, and it considered as the six length directions/inch and the seven width directions/inch. Next, 170 degrees C refined after the heat set during 1 minute, it dyed (orange), this base material was dried, and the heat set was performed for 30 seconds at 140 degrees C.

[0026] Next, the polyester system polyurethane polymer 18 weight section, the fluorine system water-repellent 1 weight section, the hexamethylene di-isocyanate 1 weight section, the polyethylene-glycol 5 weight section, and the white-pigments 5 weight section. The paint liquid (viscosity of 1500cps / 30 degrees C) which dissolved in the dimethylformamide 70 weight section and was distributed on the rear-face textiles of the aforementioned base material Abbreviation 200 g/m<sup>2</sup> application (wet) is carried out using a knife exaggerated roll coater. Subsequently, after leading into the solution contained 5 % of the weight of dimethylformamides and carrying out immersing gelling for 5 minutes at 30 degrees C, it washed for 10 minutes by the 50-degree C warm water bath, and the hot-air-drying back was performed at 120 degrees C, and heat treatment was performed for 5 minutes at 140 degrees C.

[0027] After being immersed into the solution containing 1 % of the weight of fluorine system water repellents and extracting the obtained coating textile uniformly with a mangle, heat treatment was performed for 30 seconds at 150 degrees C.

[0028] It is incised-wound resistance 180 g, and the obtained waterproof sheet was thin, it was very flexible, and water-resistance 2000mmH<sub>2</sub>O/cm<sup>2</sup> and moisture-vapor-transmission 3500 g/m 2-24 hours, and the incised-wound-proof nature with NT cutter edge which it is good and is mentioned later were [ as waterproofing garments, it was light and ] strong.

[0029] The same waterproof sheet as the above-mentioned example was created using the base material (base material which consists of two-layer [ which does not contain Para system aromatic-polyamide fiber ]) which consisted of only surface fiber layers on the other hand among the fiber layers which constitute the aforementioned base material. The incised-wound-proof nature of this waterproof sheet was incised-wound resistance 37 g, and was very weak.

[0030] In addition, a water resistance, a moisture vapor transmission, and incised-wound resistance physical properties were measured according to the following method, respectively.

Water resistance: JIS L-1079 moisture vapor transmission: JIS Incised-wound [-proof / Z-0208 ] nature: The incised-wound resistance indicated in the text estimated.

[0031] The nylon thread same for rear-face layer textiles as the object for surface-layer textiles and the tensile strength of a single fiber are nylon filament yarn of 210 deniers of sizes which carried out \*\* NEN for example 2 surface-layer textiles at 100 T/m S Yori 23 g/d The filament yarn (it is \*\* NEN to 100 T/m S Yori) which is 200 deniers which is Para system aromatic-polyamide fiber was prepared. Setting density of surface textiles to length 60/inch and width 54/inch, the density of rear-face textiles manufactured the double textiles set to length 30/inch, and width 27/inch.

[0032] It set in the example 1, rear-face textiles made length of nylon thread and Para system aromatic-polyamide fiber thread, and width the union of 1 alternation, and the binder yarn with surface textiles manufactured the base material by the same method as an example 1 except using as length thread of the nylon thread of rear-face textiles.

[0033] Next, after carrying out the heat set of this base material for 30 seconds at 150 degrees C, it refined, dyed and (MOS blue) dried and the heat set was performed at 150 degrees C.

[0034] Next, the polyester system polyurethane polymer 15 weight section, the hexamethylene di-isocyanate 2 weight section, the polypropylene-glycol 3 weight section, and the toner 5 weight section. The paint liquid (viscosity of 1300cps / 30 degrees C) which dissolved in the dimethylformamide 75 weight section and was distributed on the rear-face textiles of the aforementioned base material Abbreviation 180 g/m<sup>2</sup> application (wet) is carried out using 3 reverse roll coaters. Subsequently, after leading into the solution contained 10 % of the weight of dimethylformamides and carrying out immersing gelling for 5 minutes at 30 degrees C, it washed for 10 minutes by the 50-degree C warm water bath, and heat treatment was performed for 5 minutes at 140 degrees C after hot air drying.

[0035] After being immersed into the solution which contains 1 % of the weight of fluorine system water repellents further and extracting the obtained waterproof sheet uniformly with a mangle, heat treatment was performed for 30 seconds at 150 degrees C. The waterproof sheet obtained in this way was thin, it was as good as water-resistance 2500mmH<sub>2</sub>O/cm<sup>2</sup> and moisture-vapor-transmission 4000 g/m 2.24 hours, and incised-wound-proof nature was the waterproof sheet which is excellent with incised-wound resistance 210 g, and was excellent also in moisture permeability also at protection nature.

[0036] as the fiber of example 3 surface layer -- crimp finished yarn of 75 deniers of polyester -- as the fiber of a rear-face layer -- single fiber tensile strength -- 23 g/d it is -- double knitting (reversible four lots) was manufactured by the circular knitting machine of 30 inches of 24 gages using the No. 30 count spun yarn which consists of Para system aromatic-polyamide fiber The ratio of the surface-layer fiber of this knitting and rear-face layer fiber is 38:62. Subsequently, this round-braid object was refined and dyeing (light blue)-back-\*\*\*\*\*(ed), the heat set was performed for 1 minute at 180 degrees C, and the base material was manufactured. On the other hand, the polyurethane polymer coat was performed as follows and produced the film separately. That is, it is a mold-release characteristic base material. nylon taffeta (length and nylon filament yarn with a width of 70 deniers --) 100 length densities/inch and 87 width densities/inch are used. After giving this taffeta a water-repellent finish by the fluorine system water repellent (2 % of the weight of coating weight), On one side of this taffeta, the polyester system polyurethane polymer 20

weight section, the fluorine system water-repellent 0.5 weight section, 300 g/m<sup>2</sup> application (wet) is carried out. the paint liquid (viscosity of 1600cps / 30 degrees C) which dissolved in the dimethylformamide 72.5 weight section and prepared the isophorone diisocyanate 2 weight section and the polyethylene-glycol 5 weight section -- a knife exaggerated roll coater -- using -- about -- Subsequently, it led into the solution contained 5 % of the weight of dimethylformamides, and for 10 minutes, hot water rinsing was carried out for 30 minutes at 80 degrees C, hot air drying was carried out after gelling, at 30 degrees C, and the polyurethane polymer coat was produced on this taffeta. Imprint adhesion of this polyurethane polymer coat was carried out at the aforementioned base-material rear face by the following method, namely, -- while carrying out the print application of the acrylic-ester copolymer partially at the polyurethane polymer coat side of this taffeta using the engraved roll whose print area is 50% in the shape of a multipoint about the toluol solution (viscosity of 1900cps / 30 degrees C) containing 3 % of the weight of 15-% of the weight and TORIMECHIRO-propane-hexamethylene di-isocyanate (mole ratio 1:3) addition products After making it the rear-face textile section of double knitting pressure-welding arrival and carrying out hot air drying to it, this nylon taffeta was exfoliated and the waterproof sheet was manufactured. This sheet performed the still more nearly same water-repellent finish as an example 1.

[0037] The obtained waterproof sheet is as good as water pressure-proof 3000mmH<sub>2</sub>O/cm<sup>2</sup>, and moisture-vapor-transmission 4000 g/m 2-24 hours, and incised-wound-proof nature was extremely excellent with incised-wound resistance 441 g.

[0038] As an object for example 4 surface fiber layers, weaving of the textiles of the 210 denier value common organization of nylon filament yarn was carried out. The textile densities after dyeing and finishing were length 64/inch, and width 53/inch. moreover -- as the object for middle fiber layers -- single fiber tensile strength -- 23 g/d it is -- the plain-stitch object was manufactured by the circular knitting machine of 22 gages using the No. 30 count spun yarn which consists of Para system aromatic-polyamide fiber the eyes of this knitting -- 100 g/m<sup>2</sup> it was .

[0039] On the other hand, the polyurethane polymer coat produced the film separately as follows. That is, it is a mold-release characteristic base material. polyester taffeta (length and Dacron filament yarn with a width of 75 deniers --) After giving this taffeta a water-repellent finish using 98 length densities/inch and 88 width densities/inch by the fluorine system water repellent (2 % of the weight of coating weight), Use the paint liquid of an example 3 for one side of this taffeta, and the abbreviation 200 g/m<sup>2</sup> application (wet) of it is carried out using a knife exaggerated roll coater. Subsequently, it led into the solution contained 5 % of the weight of dimethylformamides, and for 10 minutes, hot water rinsing was carried out for 30 minutes at 80 degrees C, hot air drying was carried out after gelling, at 30 degrees C, and the polyurethane polymer coat was produced on this taffeta. Next, lamination processing was performed with the front face of the plain-stitch object which consists of Para system aromatic-polyamide fiber manufactured independently previously, carrying out a print application partially [ it is the same and ] further at an engraved roll using the binder solution of an example 3, after giving a under coat by the acrylic resin, after performing calendering for the nylon textiles manufactured previously after water repellent finishing. 50 degrees C riped in the state where it wound up firmly for 24 hours.

[0040] Then, on the polyurethane polymer coat manufactured previously, while print area carried out the print application partially using the engraved roll which is 30% using the same binder solution as the above, lamination processing was performed previously and 50 degrees C and 48-hour digestion were carried out. Next, the ear was cut after exfoliating a mold-release characteristic base material, the fluorine system water repellent was processed at 130 degrees C, and 180 degrees C and the finishing set for 30 seconds were performed.

[0041] Thus, the obtained waterproof sheet is water pressure-proof 2500mmH<sub>2</sub>O/cm<sup>2</sup> and moisture-vapor-transmission 3500 g/m 2-24 hours, and incised-wound-proof nature was excellent with incised-wound resistance 235 g.

[0042]

[Effect of the Invention] this invention is very effective as working clothes (a uniform and leisure wear are included) in the field of which protection functions, such as leisure fields, such as a guard official, forest work, or \*\*, are required by offering the waterproof sheet which has the outstanding incised-wound-proof nature and outstanding \*\*\*\*\*-proof, and moreover has moisture permeability, and having improved remarkably the incised-wound-proof nature by the sharp projection especially.

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[Translation done.]